NASA SBIR/STTR Technologies

Security-Enhanced Autonomous Network Management for Space Networking
2010 Topic O1.06 Space Networking

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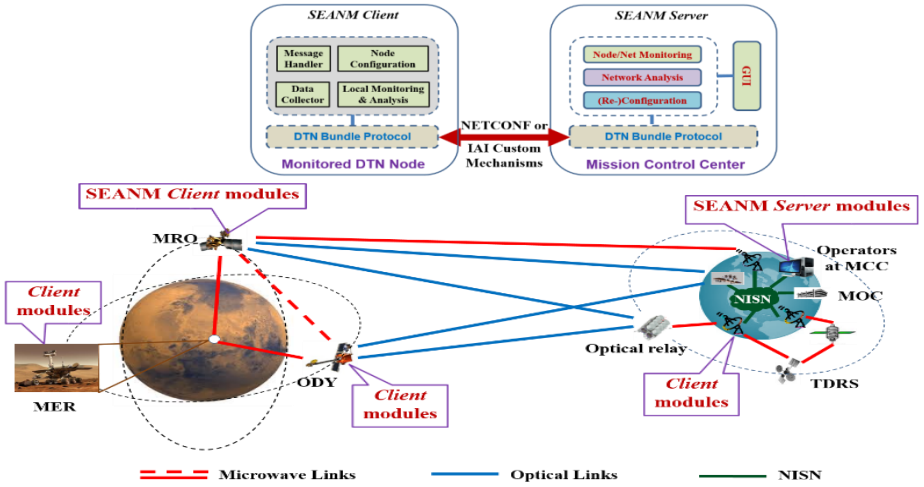
Identification and Significance of Innovation

The network management in the next-generation space networks faces the following challenging issues: 1) Integrated network management functions, which use common standards and implementations such as delay-tolerant network (DTN) services, are needed to serve the satellite customers; 2) Satellite operations currently use a highly manual approach. The research and development of autonomous operations has been conducted recently but is still at early stage; 3) Due to different characteristics of satellite networks, security management and other network management functions that are widely adopted in the traditional wired networks are not fully suitable to satellite networks. To address these issues, we developed a Security-Enhanced Autonomous Network Management (SEANM) system to enable automatic network management with intelligent analysis in space networking. Our approach allows the system to adaptively reconfigure its network elements based upon awareness of network conditions, policies, and mission requirements.



TRL Range at the end of Contract (1-9): 5/6

Technical Objectives and Work Plan

The objective of this Phase II effort is to develop an autonomous networking and network management system for space networking through an efficient cross-layer negotiation approach. Towards this, specifically, we planned to work in the following aspects:

1) Advanced bundle protocol – based DTN network support
2) Proactive network monitoring and prediction
3) Cross-layer information sharing and negotiation
4) Network analysis and reconfiguration, and
5) Security schemes.

With the key components resulting from the above aspects, our tool can provide an integrated solution that facilitates reliable and autonomous network management in space environments.

NASA and Non-NASA Applications

The developed solution can be applied to the NASA's efforts on the integration of its current agency networks. The potential customers of our solution include robotic and human missions at locations ranging from the near Earth (e.g., EO-1) to deep space (e.g., Mars exploration). The developed solution or associated mechanisms can also be applied to the current/future DTN testbed such as DTN-Bone.

The developed tool can be applied to various military networks potentially supporting a number of major programs like Airborne Networks, and Joint Tactical Network Center (JTNC), etc. It can be adopted in various military radios, e.g., JTRS AN/PRC-154 Rifleman Radio.

Potential commercial applications include satellite communications, wireless ad hoc networks, cognitive radio networks, and vehicle networks.

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